

THE SOUTH AFRICAN MUSEUM'S *MEIRING NAUDE* CRUISES

PART 4

ECHINODERMS

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ABSTRACT

This paper lists the echinoderm species recently collected in deep water off Natal and is annotated to indicate the eighteen new records for the South African area and the resultant extensions of range. Notes are also given to distinguish the additional species from those keyed and described in a recent paper.

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INTRODUCTION

The material upon which this report was based was collected by the *Meiring Naude* during 1975 and 1976 between 26°50'S and 29°13'S off Natal at depths mostly between 500 and 1 300 metres. Further details of the Station List will be found in the first paper of this series (Louw 1977). One holothurian was inadvertently included (pressed against an echinothuriid). Otherwise the collection consists mainly of ophiuroids, with smaller numbers of asteroids, echinoids and crinoids.

Having just completed what was thought to be a comprehensive survey of the echinoderm fauna of southern Africa south of Capricorn, except for holothurians (Clark & Courtman-Stock 1976), it was disillusioning to find that no less than 10 species of ophiuroids, 5 of asteroids, 2 echinoids and the 1 holothurian are new to the fauna of this area. Most, if not all, of these new records are extensions of range from the Indo-West Pacific, which was to be expected from our previous knowledge of the distribution of the echinoderms of south-east Africa. Unfortunately, positive identifications could not be given for all the additional species because of inadequacy of material, notably for four of the starfish species. Hopefully this situation will soon be resolved by further collections.

Apart from the records of species new to southern Africa, this material also provides minor extensions of range, both horizontal and vertical, for species already cited in the main faunal study.

In the list of species collected that follows, new records for southern Africa (south of the Tropic of Capricorn) are marked *. The latitude/longitude degree grid references and extensions of depth range are given to supplement those in Clark & Courtman-Stock (1976).

LIST OF THE SPECIES COLLECTED

Class CRINOIDEA

Democrinus chuni (Döderlein, 1907)

Sts SM 16, 53, 61, 75, 78, 86, 94, 103 and 109, 384–1 300 metres, 46 specimens.

Grid additions: 28/32/vd, 26/33/vd (vd = very deep, 500+ metres).

Crotalometra magnicirra (Bell, 1905)

St. SM 86, 550 metres, 2 specimens. Grid addition: 27/32/vd.

Antedonid sp. indet.

Sts SM 38, 66, 86 and 107, 550–1 000 (?1 200) metres, 4 poor specimens.

Subclass ASTEROIDEA

Astropecten leptus H. L. Clark, 1926

St. SM 83, 810–600 metres, 1 specimen. Grid addition: 28/32/vd; depth range extended from 375 metres.

Persephonaster roulei euryplax Mortensen, 1933

St. SM 71, 1 050 metres, 1 specimen. Grid addition: 27/33/vd; depth range extended from 410 metres.

Astropectinid sp. juv. ?*P. roulei euryplax* or *Psilaster acuminatus* Sladen, 1889

St. SM 66, 780–720 metres, 1 specimen. (R = 22 mm).

**Cheiraster triplacanthus* Fisher, 1913

St. SM 71, 1 050 metres, 3 specimens. Grid reference: 27/33/vd.

Previously known from the Moluccas.

**Pseudarchaster* sp. aff. *P. myobrachus* Fisher, 1906

St. 72, 1 050 metres, 1 specimen.

P. myobrachus is known from the Hawaiian Islands.

Calliaster acanthodes H. L. Clark, 1923

SAM-A22780, Tugela Bank, 1/4/1974, coll. O.R.I., 1 specimen. (Not from *Meiring Naude* collection.)

**Henricia* sp. ?*H. microplax* Fisher, 1917

St. SM 86, 550 metres, 1 specimen.

H. microplax is known from the Philippine Islands.

**Solaster* sp. aff. *S. paxillatus* Sladen, 1889 and *S. tropicus* Fisher, 1913

Sts SM 44 and 66, 720–768 (?780) metres, 2 specimens.

S. paxillatus is known from south-east Japan to Alaska and *S. tropicus* from the Moluccas.

Hymenaster sp. indet.

St. SM 107, 1 200–1 000 metres, 3 poor specimens.

Pteraster or *Diplopteraster* sp. indet.

St. SM 66, 780–720 metres, 1 poor specimen.

**Zoroaster* sp.

St. SM 107, 1 200–1 000 metres, 1 poor specimen.

Eight species of *Zoroaster* have been recorded from the Indian Ocean.

Subclass OPHIUROIDEA

Ophioscolex dentatus forma *spiniger* Mortensen, 1933

Sts SM 16 and 23, 384 (?376)–400 (?450) metres, 5 specimens.

Amphilimna ? sp.

St. SM 53, 720 metres, 1 poor specimen.

Ophiacantha baccata Mortensen, 1933

Sts SM 23 and 86, 450 (?400)–550 metres, 23 specimens. Depth range extended from 440 metres.

Ophiacantha striolata Mortensen, 1933

St. SM 23, 450–400 metres, 1 poor specimen. Grid addition: 27/32/d (d = 100–499 metres).

**Ophiolimna ?perfidia* (Koehler, 1904)

St. SM 77, 780 metres, 1 poor specimen. Grid reference 27/32/vd.

O. perfidia is known from Indonesia to southern Japan.

**Ophiophthalmus relictus* (Koehler, 1904)

Sts SM 43(?), 60(?), 66(?), 74 and 107, 420 (?360) – 1 000 (?1 200) metres, 26 specimens, 17 of them small and not positively identifiable. Grid references 28/32/vd, 27/32/vd.

Previously known from the Gulf of Aden, Timor and southern Japan.

**Ophioplinthaca papillosa* H. L. Clark, 1939

St. SM 107, 1 200–1 000 metres, 2 specimens. Grid reference: 28/32/vd.

Previously known from the Gulf of Aden and the Maldive area.

**Ophioplinthaca rudis* (Koehler, 1897)

Sts SM 58, 66, 71, 74, 90 and 107, 780 (?720) – 1 050 (?1 200) metres, 72 specimens. Grid references: 28/32/vd, 27/32/vd, 27/33/vd.

Previously known from the Zanzibar area to Timor and southern Japan.

Ophiothamnus remotus forma *cordatus* Mortensen, 1933

Sts SM 16, 23, 60, 78, 86 and 103, 384 (?376) – 800 (?810) metres, 94 specimens. Grid additions: 28/32/vd, 27/32/vd; depth range extended from 457 metres.

Ophiotreta durbanensis (Mortensen, 1933)

Sts SM 23 and 86, 450 (?400) – 550 metres, 5 specimens. Grid addition: 27/32/vd; depth range extended from 450 metres.

**Ophiotreta matura* (Koehler, 1904)

Sts SM 22, 77(?) and 107, 700 (?492) – 1 000 (?1 200) metres, 3 specimens. Grid references: 28/32/vd, 27/32/vd.

Ophiotreta sp. aff. *O. matura* (Koehler)

St. SM 92, 720–650 metres, 1 small specimen.

Ophiotreta sp. indet.

Sts SM 66 and 67, 680–780 metres, 3 poor specimens.

Amphiura albella Mortensen, 1933

St. SM 67, 700–680 metres, 7 specimens. Grid addition: 27/32/vd; depth range extended from 412 metres.

Amphiura grandisquama natalensis Mortensen, 1933

Sts SM 16, 38, 60, 86 and 103, 384 (?376) – 800 (?825) metres, 33 specimens. Grid additions: 28/32/vd, 27/32/d, vd.

**Amphiura* sp. aff. *A. atlantica* Ljungman, 1867

Sts SM 53 and 60, 720–800 (?810) metres, 13 small specimens.

Amphipholis squamata (Delle Chiaje, 1828)

Sts SM 78, 86, 94 and 103, 550–750 metres, 11 small specimens. Grid additions: 28/32/vd, 27/32/vd; depth range in South Africa extended from 172 metres.

Amphilepis scutata Mortensen, 1933

Sts SM 53 and 60, 720–800 (?810) metres, 4 specimens. Grid additions: 27/32/vd, 26/33/vd; depth range extended from 410 metres.

**Histampica duplicata* (Lyman, 1875)

Sts SM 66, 77 and 103, 680–780 metres, 5 specimens. Grid references: 28/32/vd, 27/32/vd.

Previously known from the tropical West Atlantic and East and West Pacific.

Ophiothrix aristulata Lyman, 1879

Sts SM 16(?) and 23, 384 (?376) – 400 (?450) metres, 3 small specimens. Grid addition: 27/32/d.

**Anophiura simplex* H. L. Clark, 1939

St. SM 53, 720 metres, 1 specimen. Grid reference: 26/33/vd.

Previously known from south of Arabia.

**Aspidophiura corone* Hertz, 1927

Sts SM 31, 53, 60 and 78, 720–800 (?810) metres, 56 specimens. Grid references: 28/32/vd, 27/32/vd, 26/33/vd.

Previously known from off equatorial east Africa.

Astrophiuira permira Sladen, 1879

Sts SM 16, 23, 60, 86, 94, 103 and 109, 384 (?376) – 1 300 metres, 74 specimens. Grid additions: 28/32/vd, 27/32/vd; depth range extended from 376 metres.

**Homalophiuira schmidtotti* (Hertz, 1927) comb. n.

St. SM 38, 775–825 metres, 1 specimen. Grid reference: 28/32/vd.

Previously known from off equatorial east Africa and Indonesia.

Ophiura flagellata (Lyman, 1878)

St. SM 107, 1 200–1 000 metres, 8 specimens. Grid addition: 28/32/vd.

Ophiurid sp. juv. ? *Homalophiuira* sp.

St. SM 109, 1 300 metres, 1 small specimen.

Ophiopallas paradoxa Koehler, 1904

St. SM 16, 376–384 metres, 1 small specimen.

Class ECHINOIDEA

Araeosoma paucispinum H. L. Clark, 1924

St. SM 15, 454–280 metres, 3 specimens.

Phormosoma bursarium A. Agassiz, 1881

Sts SM 22, 38, 53 and 107, 700 (?492) – 1 000 (?1 200) metres, 7 specimens. Grid additions: 28/32/vd, 26/33/vd; depth range extended from 840 metres.

Temnopleurus reevesi (Gray, 1855)

St. SM 23, 450–400 metres, 1 small specimen. Grid addition: 27/32/d; depth range extended from 102 metres.

**Echinocyamus scaber* forma *subconicus* Mortensen, 1948

Sts SM 15, 23, 60, 69, 78, 86 and 103, 450 (?280) – 800 (?810) metres, 30 specimens. Grid references: 28/32/vd, 27/32/d, vd.

Forma *subconicus* previously known from the Kei Islands, Indonesia but *E. scaber* from off equatorial east Africa to south-east Australia and the Hawaiian Islands.

**Gymnopatagus magnus* A. Agassiz & H. L. Clark, 1907

St. SM 107, 1 200–1 000 metres, upper side only of 1 specimen. Grid reference: 28/32/vd.

Previously known from the Andaman Islands to Indonesia and Japan.

Class HOLOTHURIOIDEA

**Orphnurgus glaber* Walsh, 1891

St. SM 107, 1 200–1 000 metres, 1 specimen (squashed against an echinothuriid in preservation).

Previously known from the Bay of Bengal to Japan and the Hawaiian Islands.

SYSTEMATIC SECTION

Class CRINOIDEA

Family Thalassometridae

Crotalometra magnicirra (Bell)

Antedon magnicirra Bell, 1905: 141, pl. 4.

Crotalometra magnicirra: Gislén, 1938: 17–18. A. H. Clark, 1950: 97–100. A. M. Clark, 1974: 427–429. A. M. Clark & Courtman-Stock, 1976: 18.

St. SM 86, 27°59,5'S 32°40,8'E, 550 metres, 2 specimens.

One specimen is small. The other has arm length 70+ mm, probably *c.* 100 mm. The high rugose centrodorsal is 4,6 mm high, the breadth (obscured by the cirri) approximately the same.

The specimen is unusual in having 6 out of the 7 second division (IIBr) series present with only 2 ossicles rather than the 4 characteristic of the genus *Crotalometra*. Only a single such short IIBr series was found in all 16 specimens

of the type series studied in 1974, though Gislén (1938) found 4 out of 10 such series in one of his specimens.

The mature cirri number *c.* XXVII, with *c.* vii immature ones, arranged in 10 columns of usually 3 cirri, separated into 5 pairs of columns by narrow triangular bare radial areas, as in the type series. Two intact peripheral cirri have 68 and 66 segments, the maximum otherwise recorded for this species being 64; also the seventh segment is the transition one, rather than the ninth or tenth. The closely appressed division series are finely rugose laterally, where the syntypes are smooth.

Finally the first pinnule (which is P_1 in this case since the IIBr series have only two ossicles) has $29 + c.$ 2 segments and measures just over 14 mm, compared with up to 27 segments and *c.* 12 mm length in P_D of the syntype described in 1974; otherwise the shape is similar.

Despite these small differences, there does not appear to be sufficient justification for regarding this sample as specifically distinct from *Crotalometra magnicirra*, especially considering the geographical approximation, the nearest previous record for the species being *c.* $29,5^\circ S$ $31,5^\circ E$.

Of the two other species of *Crotalometra*, *C. rustica*, known from the Bay of Bengal to Indonesia, and *C. sentifera*, from the Maldive area, both have the brachials beyond the arm bases more or less markedly produced and spinose at their distal edges.

Antedonidae sp(p). indet.

St. SM 38, $28^\circ 21,9'S$ $32^\circ 34,6'E$, 775–825 metres, 1 broken specimen.

St. SM 66, $27^\circ 17,5'S$ $32^\circ 54,1'E$, 780–720 metres, 1 small specimen.

St. SM 86, $27^\circ 59,5'S$ $32^\circ 40,8'E$, 550 metres, 1 small specimen.

St. SM 107, $28^\circ 37,8'S$ $32^\circ 38,4'E$, 1 200–1 000 metres, 1 small specimen.

The best of these specimens, from station SM 107, at least seems to have some affinity with *Tonrometra* of the subfamily Bathymetrinae except that P_1 is smaller than P_2 or P_3 , not larger. The centrodorsal is low conical and there is some tendency for arrangement of the sockets in vertical rows. The cirrus segments number up to 25, the distal ones short and keeled dorsally. The division series and brachials have spinose distal edges.

Class STELLEROIDEA

Subclass ASTEROIDEA

Family Astropectinidae

Astropecten leptus H. L. Clark

Astropecten leptus H. L. Clark, 1926: 6–8, pl. 1 (figs 3–4). Mortensen, 1933: 234, pl. 9 (figs 3–4). Madsen, 1950: 169. Cherbonnier & Nataf, 1973: 1268–1272, fig. 8A–F, pl. 12. A. M. Clark & Courtman-Stock, 1976: 51.

St. SM 83, $28^\circ 00,5'S$ $32^\circ 46,4'E$, 810–600 metres, 1 specimen.

R/r (the major to minor radius) = $40/8$ mm = $5,0/1$, compared with $59/11$ mm = $5,3/1$ in the holotype of *A. leptus* from off Durban in 287–348

metres. This specimen differs in having no enlarged superomarginal spines, the occurrence of which is variable in most species of *Astropecten*. It also has 3 actinal plates each side of the interradius compared with 2 in the holotype, though Madsen found up to 4 and Cherbonnier and Nataf up to 5 in their specimens from West Africa.

Family **Benthopectinidae**

Cheiraster triplacanthus Fisher

Cheiraster triplacanthus Fisher, 1913: 206. Fisher, 1919: 205–208, pl. 48 (figs 3–4), pl. 55 (figs 1, 1a).

St. SM' 71, 27°21,3'S 33°03,9'E, 1 050 metres, 3 specimens.

In the asteroid key of Clark & Courtman-Stock (1976: 33) this species runs down to *Luidiaster hirsutus* from which it differs in the greater extent of the superomarginal plates on the upper side and the triple distal superomarginal spines.

This record represents an extension of range from Celebes in the Moluccas in 1 280 metres, only the holotype being known hitherto.

The largest specimen has R/r 42/9 mm = 4,7/1, compared with 49/12 mm = 4,1/1 in the holotype. The two or three up and inwardly directed slightly curved superomarginal spines on each plate near the arm tips, characteristic of the species, are very distinctive; also the subambulacral spines are not at all enlarged. The bilobed papularia each have c. 35 pores, whereas Fisher estimated c. 80 in the holotype.

Family **Goniasteridae**

Pseudarchaster sp. aff. *P. myobrachus* Fisher, 1906

See: Fisher 1906: 1037.

St. SM 72, 27°17,8'S 33°04,5'E, 1 050 metres, 1 specimen.

R/r = 44/16 mm = 2,8/1. This ratio is intermediate between those cited in Clark & Courtman-Stock (1976: 35) of 3/1 or more for *P. tessellatus* Sladen, 1889 and 2,0–2,7/1 for the shorter-armed *P. brachyactis* H. L. Clark, 1923, already known from southern Africa but not on the south-east side. Recent studies by Halpern (unpublished thesis on the family Goniasteridae) indicate that the range of variation in the proportions of *Pseudarchaster* species is much greater than has previously been supposed. However, there are also a number of morphological differences between this specimen and *P. tessellatus*.

These include the smaller number of marginal plates, 26 in each series compared with c. 35 in *tessellatus* of similar R, the capitate rather than tapering form of the relatively short armament of the actinal plates and the absence of enlarged spinelets on these plates, as well as the shortness of the spines on the interradiol inferomarginals. These two last characters agree with *P. myobrachus* Fisher, 1906, in which R/r of the holotype is 2,6/1 and there are 23 supero-

marginals in each series at R 34 mm. However, that species has been recorded only from the Hawaiian Islands (in 780–1 240 metres).

Family Echinasteridae

Henricia sp. ? *H. microplax* Fisher, 1917

See: Fisher 1919: 437.

St. SM 86, 27°59,5'S 32°40,8'E, 550 metres, 1 specimen.

Among the three species of *Henricia* from southern Africa cited in the asteroid key of Clark & Courtman-Stock (1976: 42), this specimen differs from *H. abyssalis* in the more solid opaque spinelets and from *H. retecta* and *H. ornata* in the more compact skeleton and the multiple series of spinelets on the adambulacral and actinal plates.

It agrees with *H. microplax* Fisher, from the Philippines, in the fine and very compact skeleton with only single papulae in the individual meshes, the relatively conspicuous inferomarginal plates (at least in the proximal half of the arm) with two or three series of intermarginal plates separating them near the arm base from the smaller superomarginal series and the multiple series of subambulacral spines. Proximally there are no papulae below the superomarginals but in the distal half of the arm where the plate arrangement is more irregular the papulae approximate to the adambulacrals.

Family Solasteridae

Solaster sp. aff. *S. paxillatus* Sladen, 1889 and *S. tropicus* Fisher, 1913

Solaster sp., possibly *S. paxillatus* Sladen or *S. tropicus* Fisher, A. M. Clark & Courtman-Stock, 1976: 40 (footnote).

See: Sladen 1889: 452; Fisher 1919: 444.

St. SM 44, 29°40,6'S 32°32,5'E, 722–768 metres, 1 specimen.

St. SM 66, 27°17,5'S 32°54,1'E, 780–720 metres, 1 small specimen.

In comparison with the multiradiate South African solasterid *Crossaster penicillatus* Sladen, 1889, the skeleton of these two eight-armed specimens is much finer and more compact. Their affinities lie with *S. paxillatus* from south-east Japan and *S. tropicus* from the Moluccas, which are closely related. The holotypes of both have nine arms, but Fisher (1911) found additional North Pacific specimens of *S. paxillatus* to have eight to ten arms.

Subclass OPHIUROIDEA

Family Ophiacanthidae

Ophiolimna sp. ? *O. perfida* (Koehler, 1904)

See: Koehler 1922: 64.

St. SM 77, 27°31,6'S 32°50,0'E, 780 metres, 1 specimen.

In the ophiuroid key of Clark & Courtman-Stock (1976: 121) this specimen cuts across dichotomy no. 68, having the apical oral papilla (or pair of papillae)

somewhat blunted and a very broad fourth oral papilla present each side, coupled with very large lateral arm plates. The distal oral papilla, the relatively broad, rounded single tentacle scale and the coarse granules on the oral plates serve to distinguish it from the other South African Ophiacanthidae. It agrees with *Ophiolimna perfida* Koehler from the Philippines and Indonesia in the coarse granules on the oral plates, the operculiform distal oral papilla overlying the second oral tentacle scale, the very long and quite smooth arm spines and the single large rounded tentacle scale. The only difference noted is that the disc spines are more elongate than usual in *O. perfida*, the height sometimes exceeding twice the breadth (compare Koehler 1922, pl. 92 (fig. 6)).

Ophiophthalmus relictus (Koehler)

Ophiacantha relictus Koehler, 1904: 106–107, pl. 17 (figs 4–6).

Ophiophthalmus relictus: Koehler, 1922: 124–127, pl. 9 (figs 1–4), pl. 95 (fig. 3). H. L. Clark, 1939: 54–55.

St. SM 43, 28°45,5'S 32°24,5'E, 420–360 metres, 10 specimens.

St. SM 60, 27°09,6'S 32°58,2'E, 800–810 metres, 6 small specimens (?*relictus*).

St. SM 66, 27°17,5'S 32°54,1'E, 780–720 metres, 1 small specimen (?*relictus*).

St. SM 74, 27°38,6'S 32°52,6'E, 860 metres, 1 specimen.

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, 8 specimens.

This species cuts across dichotomy no. 69 in the 1976 key, having moderately large but well-separated radial shields; this character, together with the granules bordering the dorsal arm plates, serves to distinguish it from the other ophiacanthids of southern Africa.

The disc scaling is just distinct between the low spaced rugose granules. In the smaller specimens the granules tend to be limited to the edges of the scales. The bare radial shields are separated by about their own breadth. The dorsal arm plates are rhombic or slightly bell-shaped, usually with bead-like granules along their distal edges. The arm spines are only finely rugose and relatively short, only the uppermost of the six on the first two free segments exceeding the segment in length.

Ophioplinthaca papillosa H. L. Clark

Ophioplinthaca papillosa H. L. Clark, 1939: 49–51, figs 10–11.

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, 2 specimens.

This species cuts across dichotomy no. 75 in the 1976 key, having five arms but the distalmost oral papilla papilliform. Apart from the number of arms, it differs from *Ophioplinthaca sexradia* in having very long arm spines.

The holotype of *O. papillosa* was collected at the same John Murray Expedition station in the Gulf of Aden at 1 270 metres as a specimen of *O. rudis* (Koehler) and off Natal the two still appear to be sympatric. Although both species have the interradially creased disc and large bare radial shields characteristic of the genus, *O. rudis* has the radial shields separated and the disc spinelets (if present) slender, whereas in *O. papillosa* the radial shields are more or less

broadly contiguous and the armament is in the form of short stumps with thorny crowns, also the oral papillae of *O. rudis* are much more numerous and irregular than the three each side of *O. papillosa*.

Ophioplinthaca rudis (Koehler)

Ophiomitra rudis Koehler, 1897: 358, pl. 9 (figs 74–75).

Ophioplinthaca rudis: Koehler, 1922: 142–147, pl. 24 (figs 1–6), pl. 96 (fig. 1). H. L. Clark, 1939: 46–47.

St. SM 58, 27°09,7'S 33°01,0'E, 850–790 metres, 2 specimens.

St. SM 66, 27°17,5'S 32°54,1'E, 780–720 metres, 1 specimen.

St. SM 71, 27°21,3'S 33°03,9'E, 1 050 metres, 3½ specimens.

St. SM 74, 27°38,6'S 32°52,6'E, 860 metres, 8½ specimens.

St. SM 90, 28°09,8'S 32°47,4'E, 940 metres, 3 specimens.

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, 54 specimens.

This species falls with difficulty into the Ophiacanthidae as defined in dichotomy no. 68 of the 1976 key, since the oral papillae are numerous and irregular, though the large lateral arm plates and the long arm spines should indicate this family. Also the radial shields, though large and bare, are not contiguous, thus blurring the division of no. 69. Other comments on the distinction of *O. rudis* are given under *O. papillosa* above.

Ophiotreta matura (Koehler)

Ophiacantha matura Koehler, 1904: 112–113, pl. 23 (figs 2–4).

Ophiotreta matura: Koehler, 1922: 76–81, pls 12–14, pl. 15 (figs 1–3). H. L. Clark, 1939: 53–54. A. M. Clark & Courtman-Stock, 1976: 1, 121 (footnotes).

St. SM 22, 27°45,0'S 32°44,8'E, 700–492 metres, 1 specimen.

St. SM 77, 27°31,6'S 32°50,0'E, 780 metres, 1 specimen.

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, 1 specimen.

This species too has multiple and irregular oral papillae but the large lateral arm plates ally it with this family. It is distinguished from *Ophiotreta durbanensis* in a footnote on p. 121 of the 1976 key.

Ophiotreta sp. aff. *O. matura* (Koehler)

See: Koehler 1922: 76.

St. SM 92, 28°14,5'S 32°40,6'E, 720–650 metres, 1 small specimen.

Whereas preserved specimens of *Ophiotreta matura* usually retain (or show) a dark colouration of the arm spines, this specimen is white throughout and the spines are transparent. They are also much more thorny than in *O. matura* and even the tentacle scales are thorny. The long disc spinelets form a dense coat; they end in several thorns. The lowest arm spine becomes hooked on the distal segments, as also in *O. matura*.

Family **Amphiuridae***Amphiura* sp. aff. *A. atlantica* Ljungman, 1867

See: Mortensen 1933: 351.

St. SM 53, 26°51,1'S 33°12,5'E, 720 metres, 2 specimens.

St. SM 60, 27°09,6'S 32°58,2'E, 800–810 metres, 11 small specimens.

The largest specimen, from station 53, has d.d. (disc diameter) 4,5–5,0 mm, the radial shields are completely separate, equal in length to about half the disc radius, the disc scaling is rather deficient ventrally, the oral plates have an almost superficial flange bearing the first oral tentacle scale, the distal oral papilla is spiniform, the consecutive dorsal arm plates are narrowly separated by the lateral arm plates, there are five arm spines proximally, the lower ones tending to be slightly truncated and even a little bihamulate with a suggestion of a distal hook and there is one small tentacle scale. The reduced ventral scaling, the modified arm spines and the small tentacle scale agree with *Amphiura atlantica*, to which species it runs down in the 1976 key; also the smaller specimens (d.d. up to only 2 mm) do have the radial shields just contiguous and lack tentacle scales altogether, which may be true of *A. atlantica*. However, the flanged oral plates are quite distinct, approximating to those of *Amphilepis*, which is ranged in a separate subfamily of Amphiuridae. They are shared by *Amphiura pycnostoma* H. L. Clark, 1911, from south-east Japan but that species has the distal oral papilla papilliform, the successive dorsal arm plates contiguous and only three arm spines. The holotype of *A. pycnostoma* has one small tentacle scale.

Family **Ophiactidae***Histampica duplicata* (Lyman)*Amphiura duplicata* Lyman, 1875: 19, fig. 87, pl. 5 (fig. 78). Lyman, 1882: 136, pl. 17 (figs 10–12).*Amphiactis duplicata*: Koehler, 1922: 204–205, pl. 63 (figs 1–4).*Histampica duplicata*: A. M. Clark, 1970: 73.

St. SM 66, 27°17,5'S 32°54,1'E, 780–720 metres, 2 specimens.

St. SM 77, 27°31,6'S 32°50,0'E, 780 metres, 1 specimen.

St. SM 103, 28°31,7'S 32°34,0'E, 680 metres, 2 specimens.

This species, currently included in the Ophiactidae, may not run down to that family in dichotomy no. 60 of the 1976 key since its apical oral papilla is not markedly broadened and is in series with several lateral oral papillae each side. Difficulty may also arise at no. 68 since the oral structure may be confused with that of some ophiacanthids. The very coarse, well-defined, naked disc scales, separate radial shields, smooth and not excessively long arm spines, two tentacle scales and usual subdivision transversely of the proximalmost ventral arm plate into two, should serve to distinguish *Histampica duplicata*.

It is likely that this species will prove to be cosmopolitan.

Family Ophiuridae

Anophiura simplex H. L. Clark

Anophiura simplex H. L. Clark, 1939: 119–121, figs 55–56.

St. SM 53, 26°51,1'S 33°12,5'E, 720 metres, 1 specimen.

In the 1976 key* this species cuts across dichotomy no. 102, since only the first three pairs of pores are present on each arm but the pores of the first segment have more than one scale. The unique holotype of *A. simplex*, from the south Arabian coast, had lost its oral papillae, which are intact on this specimen and are close-fitting and rectangular, like those of *Anophiura planissima* H. L. Clark, 1939, from the Gulf of Aden. The absence of arm combs distal to the radial shields, the thin disc with a single large interradiial plate between the neighbouring radial shields and the reduction of the tentacles after the basal pores should serve to distinguish this species from the others known from southern Africa.

The Natal specimen has d.d. 6,0 mm and a.l. (arm length) 10+1 or 2 mm, so that a.l./d.d. probably does not exceed 2/1, confirming H. L. Clark's estimate that the arms of *A. planissima* are more attenuated at a ratio of *c.* 2,5/1 than those of *A. simplex*. The matt, rather than shiny, surface texture and the prolonged lateral angles of the proximal ventral arm plates also agree with *A. simplex* rather than *A. planissima*.

Aspidophiura corone Hertz

Aspidophiura corone Hertz, 1927: 79–80, pl. 7 (figs 1–2).

St. SM 31, 28°04,5'S 32°42,8'E, 740 metres, 1 small specimen.

St. SM 53, 26°51,1'S 33°12,5'E, 720 metres, 16 specimens.

St. SM 60, 27°09,6'S 32°58,2'E, 800–810 metres, 35 specimens.

St. SM 78, 27°31,6'S 32°50,0'E, 750 metres, 4 specimens.

Like *Anophiura simplex*, this species has reduced tentacle pores and single large interradiial disc scales between the radial shields, but it differs in having well-developed spiniform arm combs distal to the radial shields and the rosette of primary disc plates very conspicuous, fully contiguous and with a distinct boss on the central plate.

Astrophphiura permira Sladen

Astrophphiura permira Sladen, 1879: 401–415, pl. 20. Hertz, 1927: 83–85, pl. 7 (figs 4–5). Mortensen, 1933: 394–396, figs 90–91. A. M. Clark & Courtman-Stock, 1976: 188.

St. SM 16, 27°33,0'S 32°44,6'E, 384 metres, 17 specimens.

St. SM 23, 27°44,4'S 32°42,8'E, 450–400 metres, 10 specimens.

St. SM 60, 27°09,6'S 32°58,2'E, 800–810 metres, 22 specimens.

St. SM 86, 27°59,5'S 32°40,8'E, 550 metres, 5 specimens.

* Note an error in dichotomy 93 of the 1976 key (Clark & Courtman-Stock 1976: 124) in which the second alternative should lead to no. 101, not 100.

St. SM 94, 28°16,3'S 32°38,8'E, 670 metres, 2 specimens.

St. SM 103, 28°31,7'S 32°34,0'E, 680 metres, 17 specimens.

St. SM 109, 28°41,0'S 32°36,8'E, 1 300 metres, 1 specimen.

The arms of this species are almost invariably broken but a very few of these are intact. A very young complete specimen with the true disc diameter (less the marginal fringe) 1,1 mm and the expanded disc diameter 1,7 mm, has a free arm of five segments (the first segment becoming incorporated into the disc) measuring 1,7 mm in length. A larger specimen with expanded disc diameter 4,5 mm has a complete arm of eight free segments measuring 2,5 mm to the edge of the marginal fringe. The terminal ossicle is slightly tapering but otherwise almost cylindrical. At this size, there are five pairs of podia within the disc. A detached complete free arm of sixteen segments measures 6,5 mm. The maximum known expanded disc diameter in this species is 14 mm.

Homalophiura schmidtotti (Hertz) comb. n.

Ophiuroglypha schmidt-otti Hertz, 1927: 91–93, fig. 5, pl. 7 (figs 11–12).

St. SM 38, 28°21,9'S 32°34,6'E, 775–825 metres, 1 specimen.

Mortensen (1933) reduced *Ophiuroglypha* Hertz to the rank of a subgenus of *Ophiura* but restored it in 1936 (Mortensen 1936: 316) when dealing with the type species, *Ophioglypha lymani* Ljungman, 1870. The main distinction of *Ophiuroglypha* was a modification of the middle one of the three arm spines on the distal segments into an outwardly turned hook. Comparison of *O. schmidtotti* with *O. lymani* shows marked differences. *O. lymani* has relatively longer, markedly carinate arms, with the successive dorsal arm plates quite broadly contiguous, the arms straight-sided, a much smoother disc, discrete apical oral papillae and tentacle pores extending to about the twelfth arm segment. Conversely, there is a close resemblance between *O. schmidtotti* and *Ophioglypha inornata* Lyman, 1878, the type-species of *Homalophiura*. Both have the second oral tentacle pore opening completely outside the oral slit (in *Ophiuroglypha lymani* the pore runs into the oral slit), only four or five proximal arm segments with tentacle pores, the arm combs more or less reduced with short bead-like papillae, the disc and arm plates markedly thickened and the oral papillae and tentacle scales rectangular and very close-fitting. The main difference is the greater number of disc scales and the smaller size of the primaries, which are separated by only single series of relatively large scales in *H. inornata*, an Atlantic species. *H. schmidtotti* is very similar to *Homalophiura glypta* H. L. Clark, 1939, from the Maldive area, especially in the apparently sunken middle parts of the larger disc scales, but these are relatively smaller and have a very shiny texture in *H. glypta*.

In the 1976 key, this species runs down to no. 112 but differs from *Ophiura* (*Ophiuroglypha*) *irrorata* and *costata* in having the radial shields asymmetrically contiguous mid-radially, all the oral papillae rectangular and very close-fitting and the arms markedly moniliform.

The present specimen has d.d. 8,0 mm; the arms are all broken within 10 mm but were probably not more than as long again, so that a.l./d.d. was probably 2,0–2,5/1.

Class ECHINOIDEA

Family Fibulariidae

Echinocyamus scaber forma *subconicus* Mortensen

Echinocyamus scaber forma *subconicus* Mortensen, 1948: 188, pl. 46 (figs 34–36).

St. SM 15, 28°31,0'S 32°45,6'E, 454–280 metres, 1 specimen.

St. SM 23, 27°44,4'S 32°42,8'E, 450–400 metres, 1½ specimens.

St. SM 60, 27°09,6'S 32°58,2'E, 800–810 metres, 1 specimen.

St. SM 69, 27°12,2'S 32°56,0'E, 660 metres, 15 specimens.

St. SM 78, 27°31,6'S 32°50,0'E, 750 metres, 2 specimens.

St. SM 86, 27°59,5'S 32°40,8'E, 550 metres, 6 specimens.

St. SM 103, 28°31,7'S 32°34,0'E, 680 metres, 4 specimens.

Several of these specimens were alive when collected and are complete with spines. Their colour in spirit is green. Although the periproct is usually bare of spinelets, one specimen has *c.* 12 periproctal spines and another about 6. This throws some doubt on the weight of this character which is one of those supposed by Mortensen to distinguish the subgenus *Mortonia*. Only *Echinocyamus australis* (Desmoulins), from the Hawaiian and neighbouring Pacific Islands, and *E. polyporus* Mortensen, from New Zealand, were included by Mortensen in *Mortonia*.

The test is usually low rounded subconical, much as in the specimen from the Kei Islands illustrated by Mortensen. Length/breadth/height of one specimen is 7,75/6,80/3,75 mm, l/ht = 2,1/1. In this specimen there are three pore pairs on each side of each petal.

The largest specimen, from station SM 86, is flatter than most, l/br/ht 8,3/7,5/3,0 mm, l/ht = 2,8/1. Its periproct is naked, with relatively few plates. There are four pore pairs on each side of each petal. All the ocular pores on the apical system, except for the posterior one, are enlarged to the same size as the genital pores, as in *Echinocyamus grandiporus* Mortensen from the West Indies and Azores. This last character is not shared by the other specimens.

Echinocyamus scaber runs down to dichotomy no. 43 in the Clark & Courtman-Stock key (1976: 211). It is distinguishable from *Echinocyamus elegans* by the presence of glassy tubercles scattered over the upper side, by the much shorter petals, *E. elegans* having eight or nine pore pairs each side at this size, and by the slightly conical shape.

Family Brissidae

Gymnopatagus magnus A. Agassiz & H. L. Clark

Gymnopatagus magnus A. Agassiz & H. L. Clark, 1907: 133. Mortensen, 1951: 447–449, figs 219, 220a, pl. 26 (figs 7–9), pl. 27 (figs 8–10), pl. 61 (figs 19–26).

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, upper side of one specimen.

In the 1976 key, this species runs down to dichotomy no. 53. It is distinguished from *Spatagobrissus mirabilis* by the well-developed frontal notch in the test and from *Brissopsis lyrifera capensis* by the enlarged aboral primary spines and the shape of the peripetalous fasciole, which is not concave between the petals.

Class HOLOTHURIOIDEA

Family Deimatidae

Orphnurgus glaber Walsh

Orphnurgus asper var. *glaber* Walsh, 1891: 198.

Orphnurgus glaber: Hansen, 1975: 39–46, figs 12–13, pl. 8 (figs 5–7).

St. SM 107, 28°37,8'S 32°38,4'E, 1 200–1 000 metres, 1 squashed specimen.

This specimen is in poor condition, completely flattened and bearing the imprint of the echinothuriid against which it was pressed. There are twenty tentacles. Hansen stresses the variability of the spicules in this species. Here they are mostly in the form of rods with branching or ornamented ends, many resembling Hansen's figures 13.30, 41 and 43 but others are shorter and stout with elaborately spiny ends, like some of the spicules of *Orphnurgus asper* Théel, from the West Indies.

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